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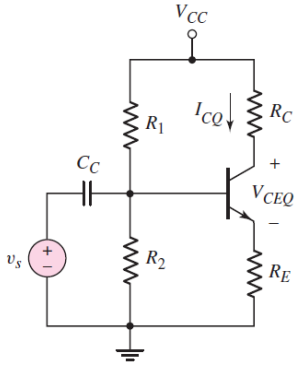
ECE322L -Homework 7 (100 points)
Assigned on Thursday, 03/12/2020-11 am
Due on Thursday, 03/26/2020-11 am

The figure below shows a common emitter amplifier configuration.
(a)Provide an expression for the maximum v_{ce}-v_{be} gain of the amplifier with the BJT still remaining in the forward active region.
(b) Discuss the possible trade-off strategies to select the Thevenin equivalent voltage seen looking from the base of the transistor into the R_1, R_2 voltage divider.
(c) Specify the role of the capacitor C_C.
(d) Discuss the possible trade-off strategies to select the resistor R_E.



(a) Assuming the BJT remains in forward-active region, therefore $I_E = (1+\beta)\, I_B$

$$A_V = \frac{V_{out}}{V_s} = \frac{-(\beta I_b)R_C}{V_s} = \boxed{-\beta R_C \left(\frac{V_{in}}{R_{ib}}\right) \times \left(\frac{1}{V_s}\right)}$$

(b) The trade-offs of using V_{TH} are that these assumptions must be true:

$R_{TH} \ll (1+\beta)R_E$, $\beta \gg 1$, and $\dfrac{\beta}{(1+\beta)} \cong 1$.

These assumptions allow us to say $V_{TH} = \dfrac{R_2}{R_1 + R_2} \times V_{CC}$.

(c) The coupling capacitor C_C acts as an open circuit to dc, isolating the signal source from the dc base current. The dc transistor biasing is then established by R_1 and R_2, and is not disturbed when the source signal is coupled.

(d) Including an emitter resistor provides stability in the Q-point, but reduces the small-signal voltage gain significantly.